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ABSTRACT

This is one of a series of 14 instructional components of a semester-long, environmental earth science course developed for undergraduate students. The course includes lectures, discussion sessions, and individualized learning carrel lessons. Presented are the study guide and script for a learning carrel lesson on soils and soil conservation practices. The slides, audio-cassette tape, and other materials necessary for this lesson are not included. (BT)

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SCIENCE EDUCATION CENTER

STUDY GUIDE AND SCRIPT

SECTION IV: NATURAL RESOURCES

LESSON 6.12: SOILS

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ENVIRONMENTAL STUDIES

A Cooperative Project of The Department of Geological Sciences and the Science Education Center

The University of Texas at Austin

SE 028 785

ENVIRONMENTAL EARTH SCIENCE

"Environmental Earth Science" is a new course developed at The University of Texas at Austin by the Department of Geological Sciences and the Science Education Center. It is offered at The University of Texas at Austin as Geology 361K and has been tried out during the spring semesters of 1972, 1973, 1974, and 1975. Revisions have been made as necessary after each tryout. The project within which the course has been developed has been supported by the National Science Foundation.

The course includes lectures, discussion sessions, and individualized Learning Carrel Lessons. Extensive use has been made of multi-media technology in the presentation of the course. Learning Carrels for individualized instruction have been especially designed for this program. The lectures introduce specific topics, suggest problems or questions, and provide background information. The discussion sessions provide the student an opportunity to ask questions and clarify ideas. The discussion sessions also provide input and feedback to the instructor.

The Learning Carrel Lessons have been written by faculty and graduate students in the geological sciences and in science education. Writers and resource contributors include Dr. Robert Boyer, Dr. Rolland Bartholomew, Dr. Keith Young, Dr. Samuel Ellison, Dr. James Underwood, Dr. David Butts, Dr. Addison E. Lee, David Keller, Melanie Lewis, Wayne Schade, Ann Lee, and William McLoda. Technicians involved in production of scripts, sound, and photography were Stan Prescott, Lee West, Charles Geffen, and William McLoda. Artists were Jesus Rivas, Alice Canestaro, Aly Knox, and Javier Flores.

Each Learning Carrel Lesson consists of a set of 2 x 2 slides, an audio cassette tape, a study guide, a script, and other materials necessary to the lesson. The study guide and script are in this booklet. Students may set their own time schedule within an announced period when slides and tapes are made available.

The student should note the list of Learning Carrel Lesson topics to place in proper content the lesson in this booklet, and then read carefully the introduction, rationale, prerequisites, and lesson objectives in the study guide. The student should follow the instructions in the study guide for the entire lesson. In some instances, these instructions are also repeated on the audio cassette tape. The slides and tapes have been synchronized to automatically advance the slides appropriate to the audiotape. However, there is a tone signal given before the change of each slide so that the lesson can be used outside of the carrel if automatic facilities are not available. When the student is ready to start the lesson, the "on" switch should be pushed. If the slides and tape are operated manually, both will need to be turned "on." The first slide is always a title slide or a blank solid colored slide. If

the slides and tape are manually operated, this title or blank slide should be on view before the tape is started. For automatic operation, the slides and tapes will be set up by the Instructor or Proctor before the lesson and between each use. It is most important to start each lesson according to these instructions in order to provide synchronization of the slides and tape. Remember that slides placed in the tray to be used with a rear view screen are reversed from those to be used with a front view screen.

The student will be instructed by the study guide and/or the tape to stop at various places to carry out certain activities. Usually the audio-tape will say, "Please stop the tape now and restart only when you have finished this exercise." Therefore, the student should wait a few seconds to finish hearing the instruction after the word "Stop." However, one should not wait long enough for the tone signal or automatic change to the next slide. This signal should be heard after you restart the tape. If the lesson is moving too rapidly, the student may stop the tape and slides at any time to consult the study guide or script, but it is NOT POSSIBLE to back up and re-examine a given slide without completing the entire cycle of the lesson.

It is particularly important for the student to carry out the instructions for activities given in the study guide. In order that a record may be maintained of these activities, each student should pick up a copy of the STUDENT RESPONSE SHEET which include questions to be answered and the other activities requiring responses. These should be completed and turned in to the instructor as required for grading, feedback for the instructor, and to provide a basis for student interaction in the discussion group.

Each Learning Carrel Lesson is independent within the context of the course. Some of them provide direct information on a given topic, but in an individualized mode requiring some activities and thought on the part of the student. Others place the student in a role-playing situation where some position must be taken on provocative questions or issues. Others deal primarily with applications of environmental information. In all the lessons, the student is expected to receive basic information that is coordinated with the lectures, the small group discussions, and the readings.

ENVIRONMENTAL EARTH SCIENCE

LEARNING CARREL LESSONS

Section I: Man's Effect on Nature

Lesson 6.1: Population
Lesson 6.2: Land Use
Lesson 6.3: Urban Crisis (Field Trip)

Section II: Energy

Lesson 6.4: Energy
Lesson 6.5: Energy Resources
Lesson 6.6: Future Projections

Section III: Processes Through Time

Lesson 6.7: Geologic Time
Lesson 6.8: Long Term Events
Lesson 6.9: Short Term Events

Section IV: Natural Resources

Lesson 6.10: Minerals
Lesson 6.11: Conflicts of Interest
Lesson 6.12: Soils
Lesson 6.13: Water

Section V: Oceanography

Lesson 6.14: Ocean Resources
Lesson 6.15: Pollution of the Oceans

STUDY GUIDE FOR LEARNING CARREL LESSON

6.12

SOILS

ENVIRONMENTAL STUDIES

A Cooperative Project of the Department of Geological Sciences and the Science Education Center

THE UNIVERSITY OF TEXAS AT AUSTIN

TO THE STUDENT:

This booklet contains two sections: (1) the Student Study Guide for this lesson, and (2) the Script or printed copy of the discussion recorded on the audio cassette tape.

You are expected to begin with the printed instructions in the Study Guide and follow them continuously as you study the lesson. In many instances the same or similar instructions may also be heard on the audio cassette tape. Refer to the script only if you need to refresh your memory as to something that was said. The script is provided because you cannot back up the tape if you need to review something already said on the tape.

Specific instructions will be given in the Study Guide as to when to start and stop the tape. Do not restart the tape until instructed to do so in the Study Guide.

Questions requiring written answers should be completed on the STUDENT RESPONSE SHEETS provided by the Instructor.

INSTRUCTIONS:

1. Read the Introduction, Rationale, and Objectives for this lesson that follows. If you have questions, check with the Instructor or Proctor.

INTRODUCTION:

This lesson is designed to focus your attention on the need for good soil conservation practices. The lesson begins by showing that man's food and our soil can be closely related. After establishing this point, the program succinctly develops several basic concepts about soils. The introduction of a time scale for soil formation and the implication that man can rapidly destroy the soil forms a transition for the ideas related to good soil conservation practices.

The program ends with four examples of good soil conservation practices. You are asked to relate these farming scenes to ideas previously developed in the program.

RATIONALE:

The value of our soil has long been overlooked by most people. Several reasons seem to contribute to this oversight. First, most of us are urban people and seldom obtain our food in any other way than buying it at the grocery store. Second, we always have enough food whenever we want it and therefore don't worry or think about the source of our food. Third, we don't fully appreciate the soil because we have never been faced directly with the consequences of poor soil conservation practices. It's the age-old idea -- you don't know what you are missing until you are without it. However, because our urban environment prevents us from having a first-hand experience with soils should not keep us from recognizing and appreciating this wonderful and absolutely essential natural resource. With care, soils can be a renewable resource for all time.

OBJECTIVES OF THIS LESSON:

Upon completion of this lesson you should be able to:

1. describe 4 good soil conservation practices
2. explain how plant material is returned to the soil
3. list 12 of the chemical elements that are essential for plant growth
4. apply the textural triangle and classify a soil on the basis of given compositions
5. cite an original example of the food web and its relationship to the soil
6. describe a hypothetical soil profile

INSTRUCTIONS:

2. Start the audio cassette tape and slides. (For manually operated slide carousels, be sure the slide on the screen is the title slide or the blank colored slide in slot number one. Otherwise, the slides and tape will not be synchronized.) Listen to the tape and view the slides until reference is made to Frame 1 and you are told to stop the tape. Then STOP THE TAPE AND SLIDES and answer the question in Frame 1 on your STUDENT RESPONSE SHEET.

Frame 1

In the spaces provided on your STUDENT RESPONSE SHEET, write the names of the 16 chemical elements essential for plant growth.

INSTRUCTIONS:

3. Restart the audio cassette tape. Listen to the tape and view the slides until reference is made to Frame 2, then STOP THE TAPE AND SLIDES and answer the question in Frame 2 on your STUDENT RESPONSE SHEET.

Frame 2

Write the definition of soil shown on the slide.

INSTRUCTIONS:

4. Restart the audio cassette tape. Listen to the tape and view the slides until reference is made to Frame 3, then STOP THE TAPE AND SLIDES. Answer the question in Frame 3 on your STUDENT RESPONSE SHEET.

Frame 3

What is the textural name of soil that contains 20% clay, 40% sand, and 40% silt?

INSTRUCTIONS:

5. Restart the audio cassette tape. Listen to the tape and view the slides until you are told to go to the table and observe soil samples, and to stop the tape. Then STOP THE TAPE AND SLIDES and study the textural triangle.

INSTRUCTIONS:

6. Restart the audio cassette tape. Listen to the tape and view the slides until you are told to stop the tape, go to the table, and observe some mull taken from a compost pile. Then STOP THE TAPE AND SLIDES and study the mull on the table.

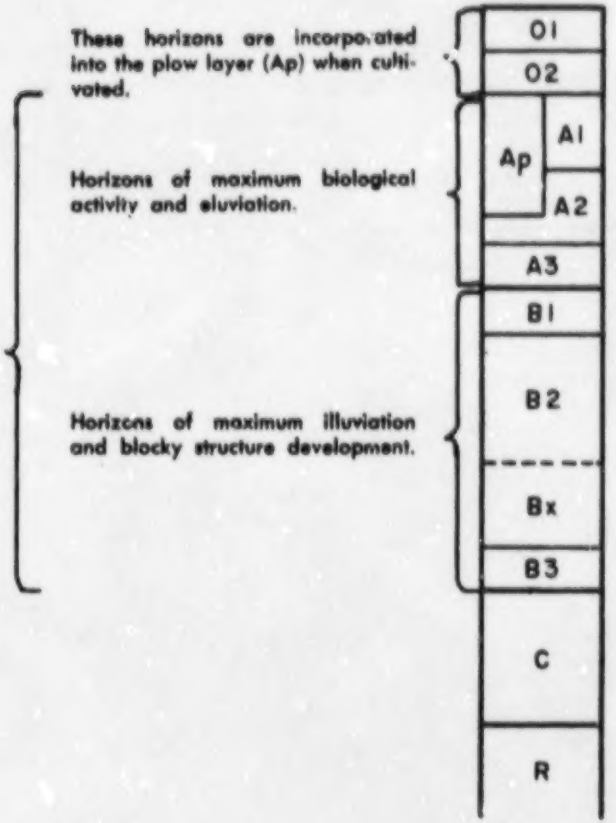
INSTRUCTIONS:

7. Restart the audio cassette tape. Listen to the tape and view the slides until reference is made to the soil profile as illustrated on the following page. Then STOP THE TAPE AND SLIDES and study the soil profile and all principal horizons.

HYPOTHETICAL SOIL PROFILE AND ALL PRINCIPAL HORIZONS

THE SOLUM

The genetic soil developed by soil-forming processes.



Fresh and partially decayed vegetative matter

Decomposed plant and animal residues—humus

Dark-colored surface mineral horizon with incorporated organic matter

Light-colored subsurface horizon which has had clay, iron, and organic matter removed (eluviated)

Transitional to B but more like A

Transitional to A but more like B

Subsoil or horizon of maximum clay and iron accumulation

Bx indicated a fragipan which is a compact, brittle horizon occurring in some soils and is nearly impervious to water and roots

Transitional to C but more like B

Unconsolidated mineral horizon which may be weathered but had been only slightly influenced by soil-forming processes.

Consolidated bedrock

INSTRUCTIONS:

8. Restart the audio cassette tape. Listen to the tape and view the slides until reference is made to Frame 4, then STOP THE TAPE AND SLIDES. Answer the question in Frame 4 on your STUDENT RESPONSE SHEET.

Frame 4

As shown on the slide of an Asian country, why hasn't the soil worn out?

INSTRUCTIONS:

9. Restart the audio cassette tape. Listen to the tape and view the slides until reference is made to Frame 5. Then STOP THE TAPE AND SLIDES. Answer the question in Frame 5 on your STUDENT RESPONSE SHEET.

Frame 5

What happens to the food web if the soil is destroyed?

INSTRUCTIONS:

10. Restart the audio cassette tape. Listen to the tape and view the slides until reference is made to Frame 6. Then STOP THE TAPE AND SLIDES. Answer the questions in Frame 6 on your STUDENT RESPONSE SHEET.

Frame 6

What has this farmer been doing to his land?

What does this practice prevent from happening?

INSTRUCTIONS:

11. Restart the audio cassette tape. Listen to the tape and view the slides until reference is made to Frame 7. Then STOP THE TAPE AND SLIDES. Answer the questions in Frame 7 on your STUDENT RESPONSE SHEET.

Frame 7

What is this farmer doing to his land?

What does this practice have to do with soil conservation?

INSTRUCTIONS:

12. Restart the audio cassette tape. Listen to the tape and view the slides until reference is made to Frame 8. Then STOP THE TAPE AND SLIDES. Answer the questions in Frame 8 on your STUDENT RESPONSE SHEET.

Frame 8

What is this city farmer doing?

What does this practice have to do with soil conservation?

INSTRUCTIONS:

13. Restart the audio cassette tape. Listen to the tape and view the slides until reference is made to Frame 9. Then STOP THE TAPE AND SLIDES. Answer the questions in Frame 9 on your STUDENT RESPONSE SHEET.

Frame 9

What is this farmer doing to the land?

What does this practice have to do with soil conservation?

INSTRUCTIONS:

14. Restart the audio cassette tape. Listen to the tape and view the slides until the end of this lesson. Then STOP THE TAPE AND SLIDES.

ANSWERS TO QUESTIONS IN STUDY GUIDE

FRAME 1 Answers

In the spaces provided on your STUDENT RESPONSE SHEET, write the names of the 16 chemical elements essential for plant growth.

B	Boron	Fe	Iron	Mo	Molybdenum
C	Carbon	H	Hydrogen	N	Nitrogen
Ca	Calcium	K	Potassium	O	Oxygen
Cl	Chlorine	Mg	Magnesium	P	Phosphorus
Cu	Copper	Mn	Manganese	S	Sulfur
				Zn	Zinc

FRAME 2 Answers

Write the definition of soil shown on the slide.

Soil is the layer on the surface of the earth formed by the interaction among the rocks of the earth's crust, sunlight, the atmosphere, and living organisms.

FRAME 3 Answers

What is the textural name of soil that contains 20% clay, 40% sand, and 40% silt?

Loam

FRAME 4 Answers

As shown on the slide of an Asian country, why hasn't the soil worn out?

The Asian farmers return the essential plant nutrients to the soil and the farmers have prevented the erosion of the soil by terracing.

FRAME 5 Answers

What happens to the food web if the soil is destroyed?

The food web is destroyed.

FRAME 6 Answers

What has this farmer been doing to his land?

Contour plowing.

What does this practice prevent from happening?

Contour plowing prevents erosion and helps retain runoff water, thus making it available for plant growth.

FRAME 7 Answers

What is this farmer doing to his land?

Fertilizing the soil.

What does this practice have to do with soil conservation?

This practice adds plant nutrients to the soil.

FRAME 8

What is this city farmer doing?

Making a compost pile.

What does this practice have to do with soil conservation?

The addition of the compost material to the soil supplies plant nutrients and living organisms to the soil and simultaneously improves the texture and structure of the soil.

FRAME 9 Answers

What is this farmer doing to the land?

Tilling the land in strips.

What does this practice have to do with soil conservation?

This practice maintains the soil's texture and structure.

GLOSSARY

leaching: the weathering process that is happening when solid earth materials are taken into solution.

mull: the end product formed when plant material is decomposed by living organisms in the soil.

soil: the layer on the surface of the earth formed by the interacting among the rocks of the earth's crust, sunlight, the atmosphere, and living organisms.

soil horizon: a distinctive layer of earth materials that develops within the soil profile.

soil profile: a series of horizons comprising the vertical sequence of a soil.

weathering: the geological process that breaks up the earth's materials (in sites) by physical and chemical reactions.

SCRIPT FOR LEARNING CARREL LESSON

6.12

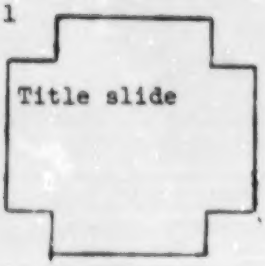
SOILS

ENVIRONMENTAL STUDIES

A Cooperative Project of the Department of Geological Sciences and the Science Education Center.

THE UNIVERSITY OF TEXAS AT AUSTIN

1



2

Yesterday at lunch a mother was heard to remark to her son, "Don't eat that corn, there's soil in it!". What do you think he did?

3

Well, he didn't do what you think. Instead he said, "I know it, Mother. All food has soil in it." What did he mean by that remark?

4

He meant that whenever you eat food, you are consuming a "bit" of soil because 13 elements essential for plant growth are found in the soil.

5

Fe, Ca, P, K, S, Mn, B, Cu, Zn, Mo, Cl, N

Here you see the symbols of the chemical elements found in soils that are essential for plant growth. Three additional elements essential for growth are carbon, oxygen, and hydrogen. Stop the tape and write down the names of these 16 chemical elements in Frame 1 of your Study Guide. Stop the tape now.

6

Where do the plants obtain the elements used in plant growth?

Think about the role soil plays in plant growth. Soil is the interface between non-living materials (the solid, liquid, and gaseous materials in the earth's crust) and the living materials found in plants. Plants are able to extract 13 of the elements listed in Frame 1 from the soil. The three elements, C, O, and H also needed by plants are obtained from carbon dioxide and water.

7

Diagram from Scientific American, 1950, V. 183, No. 1, p. 157

This slide merits careful study because it summarizes many of the reactions that take place between plants, earth materials, and living organisms. The caption for this slide points out that physical and biological processes participate in the life of the soil. In the biological processes, plants remove water and various nutrients from the soil and combine them with carbon from the air. The various plant structures eventually return to the soil and decompose, thus releasing nutrients for a new cycle of plant growth.

8

Shot showing comparison of poor plant growth and good plant growth

Imagine what happens if this cycle is interrupted by destruction of the soil interface. Poor plant growth results in poor food for animals and humans, and serious problems for mankind. That's what this program is all about -- the need for preservation of our soil.

9 Soil is the layer on the surface of the earth formed by the interaction among the rocks of the earth's crust, sunlight, the atmosphere, and living organisms.

Here you see a definition of soil. Write the definition in your Study Guide in Frame 2. Stop the tape now.

10

From Maryland Soils book, p. 3, Fig. 1

Another way of describing soil is seen in this slide. This is a schematic representation of the solid, liquid, and gaseous composition of the soil.

11

Textural Triangle

Soils can also be described on the basis of their textural characteristics. For example, if a soil contains 20% clay, 40% sand, and 40% silt, what is the soil's texture class? Write your answer in Frame 3. Stop the tape now.

12

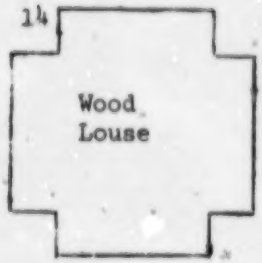
Textural Triangle with "X" at correct location

If your answer was loam, you are correct. To see and feel some soil textures first-hand, go to the table and observe the soil samples. Feel and even taste minute quantities of these samples as you look at them. Also, this is a good time to have the Proctor explain the textural triangle if you didn't get the correct answer in Frame 3. Stop the tape now.

13

Now, we'll take a look at some of the organisms that make their home in the soil. We can't show all of the organisms, but a few will suffice.

14



Here's a wood louse -- you call it a sow bug.

15

A predatory nematode.

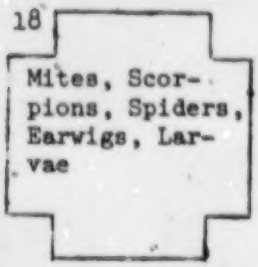
16

A small carabid beetle.

17

An earthworm.

18



There are hundreds of other organisms. Remember, each organism contributes to the making of soil -- a substance that will support plant growth. If man interferes with the work of these organisms, soil fertility will decrease.

19

Plants themselves help in making soil. The next series of pictures shows that happens to a fallen leaf. The end product, called "mull," is the result of interaction between the leaf and living organisms.

20

This slide shows a leaf being destroyed by organisms.

21

The leaf is acted on by smaller and smaller organisms — such as bacteria -- at this stage.

22

The end product -- mull -- is primarily modified by movements of soil animals through the material making open spaces. On the table you will find some mull taken from a compost pile. Look it over. Stop the tape now.

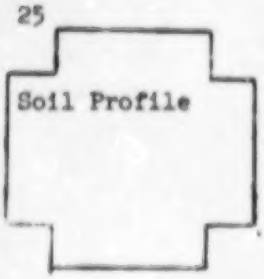
23

What is the role of weathering in the formation of soil? Geologists talk about the soil profile and you see a soil profile on this slide. Notice the different colored layers.

24

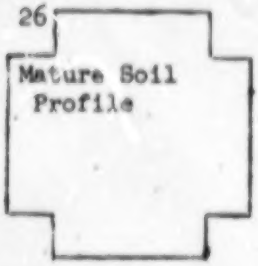
A soil profile develops because the weathering processes -- physical and chemical interactions and leaching -- break up the soil particles and redistribute the material in layers. These layers are called horizons.

25



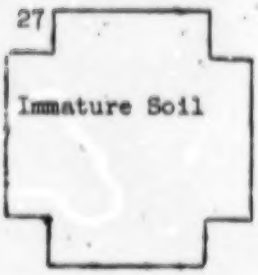
On this slide you see a hypothetical soil profile. This very complicated looking picture is really not that difficult. The O horizon contains undecomposed and partially decomposed plant remains. The O horizon is near the top of the picture. The A horizon immediately below contains minerals from the O horizon and varying amounts of organic matter. The B horizon (subsoil) contains components washed down from the A horizon. The C horizon contains weathered parent (bedrock) material. The R horizon represents the solid unweathered parent material. You will find a copy of this picture on page 4 in the Study Guide. Look at it carefully. Stop the tape now.

26



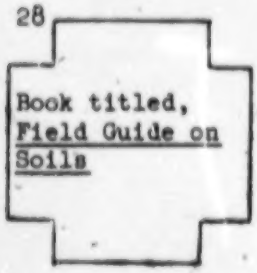
Soils with well-developed horizons are called mature soils.

27



Soils without well-developed horizons are called immature soils. Notice the sedimentary layers near the bottom of the slide.

28



The book shown on this slide has a wealth of information about soils. It contains several suggestions for the field study of soils. You may check it out from the Proctor and try out some of their activities near your home over the weekend.

29

Man scratching his head

You are probably scratching your head wondering how all this relates to our environmental studies course. We'll start to explain this by adding a time scale for the development of soils.

30

It all depends!!

How long does it take for a soil profile to develop? Mature soils in some places require hundreds of years under the best conditions. However, soil development in some places, like ash falls in Hawaii, happen rapidly.

31

Hawaiian plant growth

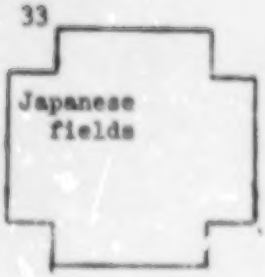
Within ten years or less luxuriant growth like this can develop on ash falls in Hawaii. However, lava flows in the same climate develop soils very, very slowly. So you see, "it all depends." We know soil can be destroyed in a very short time, and it is the destruction of soil that man must prevent.

32

Slide titled "Sick Soil"

Our environmental story concerns what happens when man uses soil both correctly and incorrectly.

33



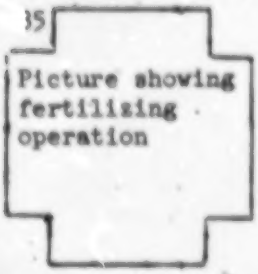
Here's a picture in an Asian country showing how man farms the land to raise plants for food. How long do you think this soil has been producing plant growth for food?

34

3,000-4,000
years

If you guessed this length of time, you're pretty good. In many parts of Asia, the people have been tilling the same soil for generations. For some reason, it hasn't seemed to wear out -- how come? Write your answer in Frame 4. Stop the tape now.

35

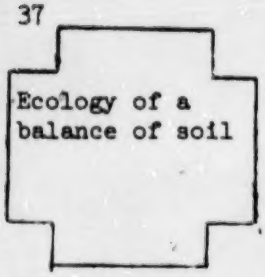


You're right -- the farmers have returned to the soil the plant nutrients that we mentioned earlier, and the Asian farmers prevented the erosion of the soil by terracing. Clearly, this shows that some soils are a renewable natural resource.

36

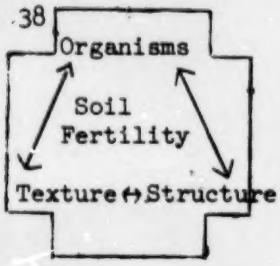
Here's a picture taken in another part of the world. Apparently this farmer forgot to do something that the Asian farmer remembered, providing careful and loving attention for the soil.

37



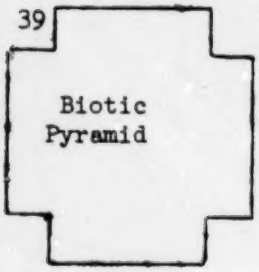
Let's see what the farmer in America forgot to do because there are other characteristics of soil that affects its fertility besides the replacement of plant nutrients.

38



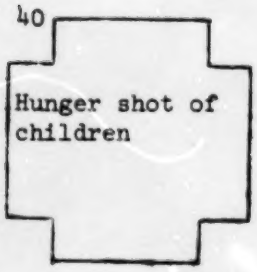
Soil fertility is influenced by the soil's texture, structure, and its living components. Anything that man does to change the fertility of the soil effects his life style -- he eats well and remains in the same area, or he may starve, or he may have to move to another area. We'll return to these ideas in a moment.

39



First study this slide carefully. This is a special case -- the grassland food web. What happens to the food web if the soil is destroyed? Write your answer in Frame 5. Stop the tape now.

40



You're right -- the food web can no longer exist. Man, whose life depends on this food web, is in serious trouble. Let's return to our discussion of ...

41

Soil fertility

42

Constant turn-over of nutrients

Under natural undisturbed conditions, there is a constant turnover of nutrients in the soil. With the advent of civilization, man began to interfere in the turnover process. Less nutrients were returned to the soil and erosion of some soils increased.

43

Where has all the soil gone?

Also, overgrazing and removal of plant growth change the texture, structure, and living organisms found in the soil. The food web is broken or inhibited.

44

Climate

Some of you are probably thinking that climatic change is a major factor affecting soil fertility. Climates do change through time. However, one of the major factors in regional climatic change is the change that takes place when man removes the plant growth, by any of several means, to expose the soil.

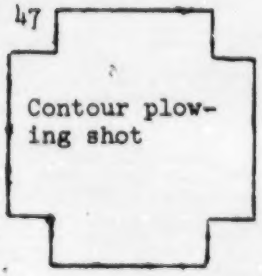
45

For example, in the 1930's this was a common sight in Colorado, Kansas, Oklahoma, and West Texas. This condition hasn't been solved even today. Will you see a scene like this in your lifetime?

46

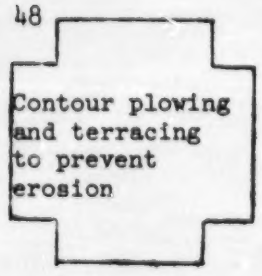
This leads us directly into the final point of this lesson -- what are some examples of good soil conservation practices? You will be shown four different farming scenes. After studying each scene, you are to write down the farming practice that is being carried on in the space provided in the Study Guide.

47



What has this farmer been doing to his land? What does this practice prevent from happening? Write your answers in Frame 6. Stop the tape now.

48

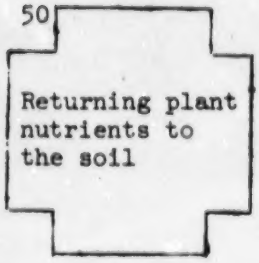


Is this the answer you wrote down?

49

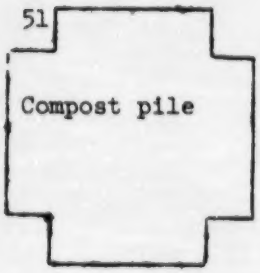
What is this farmer doing to his land? What does this practice have to do with soil conservation? Write your answer in Frame 7. Stop the tape now.

50



Is this the answer you wrote down?

51



What is this city farmer doing? What does this practice have to do with soil conservation? Write your answers in Frame 8. Stop the tape now.

52

Is this the answer you wrote down? Composting is a way of returning both plant nutrients and living organisms to the soil to improve soil fertility.

53

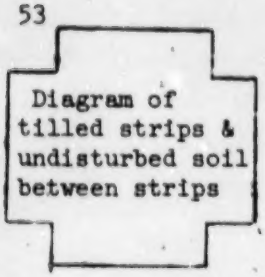
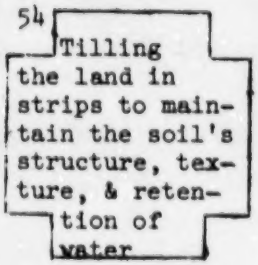


Diagram of tilled strips & undisturbed soil between strips

What is this farmer doing to the land? What does this picture have to do with soil conservation? Write your answers in Frame 9. Stop the tape now.

54



Tilling the land in strips to maintain the soil's structure, texture, & retention of water

Is this the answer you wrote down? Rather than disturbing the whole field, the farmer only tills the land in strips where the plants will grow. This practice helps maintain the soil's structure, texture, and retention of water as much as possible. The farmer also rotates his plants from year to year.

55

Let's review

Before ending this program on soils, we should review some of the important points.

56

Fertilizing scene

First, most soils represent a renewable resource provided that we resupply the soil with minerals essential to plant growth.

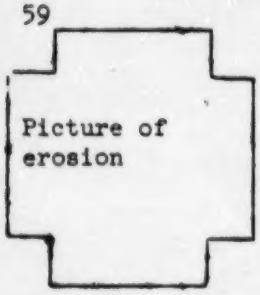
57

We do not destroy the soil organisms.

58

We do not destroy the soil texture.

59

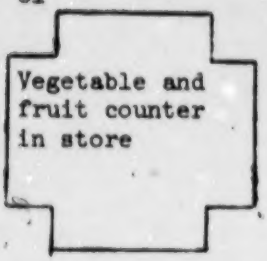


We protect the soil from erosion.

60

We do not pollute the soil with herbicides or insecticides.

61



Our survival depends upon obtaining food grown in the soil.

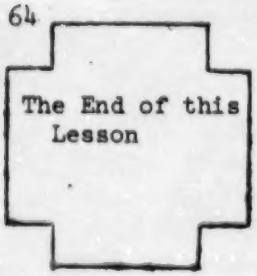
62

Fertile soil -- one of man's most precious resources -- is dependent upon man's interactions with nature.

63

We hope you will want to learn more about good soil conservation practices. One way to do this is to check out the Field Guide to Soils from the proctor. Another way is to look for good soil conservation practices in the area in which you live. We hope you find many examples of good soil conservation.

64



LESSON 6.12: SOILS

STUDENT RESPONSE SHEETS

Name _____

Date _____

LESSON 6.12: SOILS

STUDENT RESPONSE SHEET

Frame 1 In the spaces provided on your Student Response Sheet, write the names of 16 chemical elements essential for plant growth.

—	_____	—	_____	—	_____
—	_____	—	_____	—	_____
—	_____	—	_____	—	_____
—	_____	—	_____	—	_____
—	_____	—	_____	—	_____
				—	_____

Frame 2 Write the definition of soil shown on the slide.

Frame 3 What is the textural name of soil that contains 20% clay, 40% sand, and 40% silt?

Frame 4 As shown on the slide of an Asian country, why hasn't the soil worn out?

Frame 5 What happens to the food web if the soil is destroyed?

Name _____

Date _____

LESSON 6.12: SOILS

STUDENT RESPONSE SHEET

Frame 6

What has this farmer been doing to his land?

What does this practice prevent from happening?

Frame 7

What is this farmer doing to his land?

What does this practice have to do with soil conservation?

Frame 8

What is this city farmer doing?

What does this practice have to do with soil conservation?

Frame 9

What is this farmer doing to the land?

What does this practice have to do with soil conservation?